

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicants: T. KUTSUNA, et al.  
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Title: FUEL SYSTEM HAVING EXCELLENT GASOLINE BARRIER  
PROPERTY  
Group AU: 1794  
Examiner: Marc A. Patterson  
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**REQUEST FOR RECONSIDERATION AFTER FINAL REJECTION**

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Commissioner for Patents

P.O. Box 1450

Alexandria, Virginia 22313-1450

March 10, 2009

SIR:

In response to the Office Action mailed December 10, 2008, Applicants respectfully submit the following Remarks, respectfully traversing the prior art rejections in this Office Action mailed December 10, 2008. As will be shown in the following, it is respectfully submitted that the teachings of the prior art as applied by the Examiner, that is, the teachings of the U.S. patents to Gerdes, et al., No. 4,719,135, to Tashiro, et al., No. 3,704,229, to Huang, et al., No. 3,683,044, and to Watanabe, et al., No. 5,474,853, would have neither taught nor would have suggested the presently claimed subject matter. In other words, it is respectfully submitted that the teachings of these references as applied by the Examiner do not establish a prima facie case of obviousness.

In particular, and as will be shown infra, it is respectfully submitted that the Tashiro, et al., and Huang, et al. references, which do not disclose or suggest materials for fuel systems as in the present claims, would not have been properly

combinable with the teachings of Gerdes, et al., directed to different technologies than that of Gerdes, et al. and not addressing problems addressed by the present invention which is directed to fuel systems; and it is respectfully submitted that there would have been no proper reason for combining the teachings of the references as applied by the Examiner, absent hindsight use of Applicants' disclosure, which of course is improper under the guidelines of 35 USC 103.

Furthermore, it is respectfully submitted that these references as applied by the Examiner would have neither taught nor would have suggested such a fuel system as in the present claims, having the coating layer as recited in claim 1, the coating layer being formed by coating an epoxy resin composition comprising (a) an epoxy resin and (b) an epoxy resin curing agent as principal components, (1) wherein the coating layer is a barrier layer for gasoline and has a gasoline permeability coefficient of  $2 \text{ g}\cdot\text{mm}/\text{m}^2\cdot\text{day}$  or less at  $60^\circ\text{C}$  and a relative humidity of 60% RH; (2) wherein the epoxy resin includes at least one selected from an epoxy resin having a glycidylamine part derived from metaxylylenediamine, and an epoxy resin having a glycidylamine part derived from 1, 3-bis(aminomethyl)-cyclohexane; (3) wherein the epoxy resin curing agent comprises a reaction product of the following (A) and (B) or a reaction product of the following (A), (B) and (C):

- (A) metaxylylenediamine or paraxylylenediamine;
- (B) a multifunctional compound having at least one acyl group which can form an amide group part by reacting with polyamine to form a oligomer, the multifunctional compound being selected from the group consisting of acrylic acid, methacrylic acid, and derivatives of acrylic acid, methacrylic acid, maleic acid, fumaric acid, succinic acid, malic acid, tartaric acid, pyromellitic acid and trimellitic acid; and

(C) monovalent carboxylic acid having 1-8 carbon atoms and/or a derivative thereof;

and (4) wherein the coating layer contains the skeletal structure of formula (1), at least in an amount of 30% by weight based on the weight of the coating layer. See claim 1.

As will be shown in the following, it is respectfully submitted that the combined teachings of the references as applied by the Examiner do not disclose, nor would have suggested, the combination of the features of (1)-(4) in claim 1, providing unexpected advantages of unexpectedly low gasoline permeability coefficient while having good mechanical properties as a structure of a fuel system. Note that these features (1)-(4) include metaxylylenediamine or paraxylylenediamine being a reactant in forming the epoxy resin curing agent recited in the present claims.

Moreover, it is respectfully submitted that even assuming, arguendo, that the teachings of the applied references would have established a prima facie case of obviousness, the evidence of record in the above-identified application overcomes such prima facie case of obviousness, and establishes unobviousness of the presently claimed invention. As for the evidence relied on, discussed infra, note the evidence in Applicants' specification, that is, the Examples and Comparative Examples, on pages 43-50 of Applicants' specification, as well as the evidence in the Declaration Under 37 CFR 1.132 submitted with the Amendment filed September 2, 2008. Clearly, the evidence in Applicants' specification must be considered in determining obviousness. See In re DeBlauwe, 222 USPQ 191 (CAFC 1984). Note also Manual of Patent Examining Procedure (MPEP) 716.01(a), stating that Examiners must consider comparative data in the specification which is intended to illustrate the claimed invention in reaching a conclusion with regard to the

obviousness of the claims, citing In re Margolis, 785 F.2d 1029, 228 USPQ 940 (CAFC 1986). Although Applicants have clearly relied on evidence in their specification in prior responses (note, for example, page 12 of the Amendment filed September 2, 2008), the Examiner never commented upon such evidence, apparently ignoring such evidence. Such apparent failure to consider this evidence in Applicants' specification is clear error; and in proper consideration of the evidence in Applicants' specification, as well as consideration of the evidence in the aforementioned Declaration, it is respectfully submitted that Applicants have clearly overcome any possible prima facie case of obviousness established by the combined teachings of the applied references.

In connection with the submitted evidence, attention is respectfully directed to the Declaration Under 37 C.F.R. 1.132 of S. Yonehama submitted with the Amendment filed September 2, 2008. Note particularly the Additional Comparative Examples described therein, utilizing the curing agent of Tashiro, et al., prepared according to Example 1 of the Tashiro, et al. reference. Additional Comparative Example 1 provides a coating layer utilizing the curing agent of Tashiro, et al. together with an epoxy resin Epikote 828, providing a coating layer, after curing, of 10  $\mu\text{m}$ . A gasoline permeability coefficient of the coated film thus obtained was determined.

Additional Comparative Example 2 of the aforementioned Declaration provided an acrylonitrile-butadiene rubber tube according to Example 4 of the above-identified application, with a coating film being formed therein to have a thickness of 10  $\mu\text{m}$ . The tube in which the coating layer was formed was evaluated for a gasoline barrier property and a gasoline barrier property after bending.

The results of Additional Comparative Examples 1 and 2 are shown in Table A of the Declaration submitted with the Amendment filed September 2, 2008, on page 3 thereof, together with results from Examples 1 and 4 of Applicants' specification. As can be seen, the gasoline permeability coefficient according to the present invention, as well as gasoline permeability of a tube and of the tube after bending, was unexpectedly lower according to the present invention, as compared to results in Additional Comparative Examples 1 and 2. It is respectfully submitted that this Declaration shows unexpectedly better results achieved according to the present invention, utilizing the combination of epoxy resin and epoxy resin curing agent according to the present invention, as compared to combination of curing agent of Tashiro, et al. together with epoxy resin described therein and in Gerdes, et al. Comparisons of the present invention with coating layers as in Additional Comparative Examples 1 and 2 test use of curing agents outside the scope of the present claims, even closer than those of the closest prior art, i.e., Gerdes, et al., and thus constitute a proper test for establishing unexpectedly better results achieved by the presently claimed invention. It is respectfully submitted that this evidence of unexpectedly better results as compared to, e.g., structure formed using a curing agent of Tashiro, et al., but outside of those within the scope of the present claims, sufficiently rebuts any prima facie case of obviousness arising from the teachings of the applied references.

Such evidence of unexpectedly better results is further supported from the evidence in Applicants' specification, in particular, the Examples and Comparative Examples in Table 1 on page 45, showing results from Examples 1-3 and Comparative Example 1 on pages 43-45; and in Table 2 on page 50 of Applicants' specification, showing results from Examples 4-8 and Comparative Examples 2-4 on

pages 45-49 of Applicants' specification. Note particularly Comparative Example 4, on pages 49 and 50, as compared with Example 4 on pages 45-47, of Applicants' specification. It is respectfully submitted that this evidence in Applicants' specification must be considered in determining patentability, in addition to consideration of the Declaration submitted September 2, 2008; and that, properly considered, all evidence of record rebuts any possible prima facie case of obviousness established by the teachings of the applied references.

In the first paragraph on page 7 of the Office Action mailed December 10, 2008, the Examiner contends that the aforementioned Declaration "does not compare the claimed invention to the closest prior art". However, the data in the aforementioned Declaration provides test data using an epoxy resin curing agent even closer to the present invention than the curing agent of the closest prior art, i.e., Gerdes, et al., and thus constitutes a proper test. Note that the combination of curing agent used in the Declaration, from Example 1 of Tashiro, et al., and disclosed in columns 1 and 2 of Tashiro, et al., was used in light of the full disclosure of Tashiro, et al., including the Examples (note columns 3 and 4 of this patent) and the "(II) PAINT TEST" thereof, in columns 4 and 5 of this patent. Moreover, note that as the Examples of each of Tashiro, et al. and of Gerdes, et al. used Epikote 828, such epoxy resin was used in the Additional Comparative Example 2 of the aforementioned Declaration. It is respectfully submitted that taking the teachings of Tashiro, et al. and of Gerdes, et al. as a whole, selection of Epikote 828 is appropriate in connection with the closest prior art.

In addition, note that Gerdes, et al., in column 2, lines 59-64, describes that epoxy resins particularly suitable for the fuel impervious polymeric article described therein are, for example, those currently sold under the trade names Epikote 828,

EER 331 and Rutapox 0164, the most preferred being a liquid diglycide ether prepared from epichlorohydrin and diphenylpropane (bisphenol A). Note that Epikote 828 is prepared from epichlorohydrin and diphenylpropane (bisphenol A).

In view of the foregoing, it is respectfully submitted that Epikote 828 was appropriately used in the aforementioned Declaration, forming part of the closest prior art.

Moreover, as set forth in the aforementioned Declaration, the reaction product used as a curing agent in this Declaration was obtained from Components A, B and C of Tashiro, et al., different from a curing agent of the present invention. It is respectfully submitted that this curing agent utilized in the aforementioned Declaration is appropriately used in a comparison of the present invention with the closest prior art, being closer to the present invention than the curing agents disclosed in Gerdes, et al.; in this regard, note that the curing agent obtained from Components A, B and C of Tashiro, et al. is different from a curing agent of the present invention, and such curing agent from Tashiro, et al., outside the scope of the present claims, is properly utilized as a comparison of the present invention with the closest prior art.

The contention by the Examiner in the first paragraph of page 7 of the Office Action mailed December 10, 2008, that Tashiro, et al. is not limited to Example 1, and that Tashiro, et al. is also not limited to the curing of Epikote 828, is noted. It is respectfully submitted, however, that Applicants need not compare the present invention with each and every embodiment within the scope of the prior art. Noting the foregoing, and particularly the disclosure in Gerdes, et al. that “particularly suitable epoxy resins” include Epikote 828, with the “most preferred” being a liquid diglycide ether prepared from epichlorohydrin and diphenylpropane (bisphenol A),

which corresponds to Epikote 828, it is respectfully submitted that the tests utilizing Epikote 828 constitutes a fair test with an epoxy resin of the closest prior art.

The additional contention by the Examiner, in the second and third paragraphs on page 7 of the Office Action mailed December 10, 2008, in response to Applicants' argument that unexpectedly better results are obtained using the claimed epoxy and curing agent, that the combination of Gerdes, et al., Tashiro, et al. and Huang, et al. discloses the skeletal structure, as the claimed epoxy and curing agent are disclosed, is noted. It must be emphasized, however, that Applicants need not compare their invention with a combination of teachings of references. That is, as stated in MPEP 716.02(e), subheading III ("THE CLAIMED INVENTION MAY BE COMPARED WITH THE CLOSEST SUBJECT MATTER THAT EXISTS IN THE PRIOR ART"), "applicant is not required to compare the claimed invention with subject matter that does not exist in the prior art". That is, it is respectfully submitted that the evidence of record including the aforementioned Declaration provides a fair test with the closest prior art, showing unexpectedly better results in reduced gasoline permeability coefficient as well as gasoline permeability before and after bending, achieved by the present invention as compared with the closest prior art.

In addition, attention is again directed to the evidence in Applicants' specification, apparently ignored by the Examiner in considering obviousness of the presently claimed subject matter. Particularly with respect to the evidence in Applicants' specification, note Example 4 on pages 45-47 of Applicants' specification, and Comparative Example 4 on pages 49 and 50, with results shown in Table 2 on page 50. It is respectfully submitted that this evidence shows



unexpectedly advantageous (reduced) gasoline permeability of structure within the scope of the present invention, as compared with that of Comparative Example 4.

The additional contention by the Examiner, in the second full paragraph on page 9 of the Office Action mailed December 10, 2008, that Tashiro, et al. discloses in column 1, line 63, and column 2, line 14, a reaction product of metaxylylenediamine and acrylic acid derivative, as claimed, is respectfully traversed. Note that Tashiro, et al. requires, as the curing agent, a reaction product of each of components A, B and C. The aforementioned Declaration uses a curing agent for the Additional Comparative Example using not only Example 1 of Tashiro, et al. but also in light of the disclosure from column 1, line 59, to column 2, line 16, of Tashiro, et al. It is again emphasized that Applicants provide in the aforementioned Declaration structure formed utilizing the closest prior art, i.e., Gerdes, et al., with an even closer curing agent than that in Gerdes, et al., i.e., within the scope of Tashiro, et al. but outside the scope of the present claims. It is respectfully submitted that Applicants need not compare the claimed invention with subject matter that does not exist in the prior art, i.e., a combination of teachings of references, as apparently being required by the Examiner in referring to a reaction product of metaxylylene and acrylic acid derivative from the teachings of Tashiro, et al. Note the second full paragraph on page 9 of the Office Action mailed December 10, 2008.

Furthermore, and in addition to failing to establish a prima facie case of obviousness in connection with the subject matter of claim 1, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested such a fuel system as in the present claims, having features as discussed previously, and in particular wherein the epoxy resin includes the resin having a glycidylamine part derived from metaxylylenediamine as a

principal component (see claim 6), or wherein the epoxy resin includes an epoxy resin having a glycidylamine part derived from 1,3-bis(aminomethyl)-cyclohexane (see claim 23).

Moreover, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested such fuel system as in the present claims, having features as discussed previously in connection with claim 1, and, additionally, wherein the gasoline permeability coefficient is  $0.2 \text{ g}\cdot\text{mm}/\text{m}^2\cdot\text{day}$  or less (see claim 2), or, more specifically,  $0.02 \text{ g}\cdot\text{mm}/\text{m}^2\cdot\text{day}$  or less (see claim 24); and/or number average molecular weight of the epoxy resin, as in claim 25; and/or wherein the multifunctional compound (B) reacted in forming the epoxy resin curing agent is that set forth in claim 8; and/or area rate of the coating layer formed on the fuel vessel body, as in claim 9; and/or materials of the fuel vessel body or fuel vessel or molded part bodies, as in claims 10-14; and/or wherein the fuel system includes a tube body as in claim 15, with material of the tube body as in claim 16, especially with blending proportions of the epoxy resin curing agent to epoxy resin as in claim 17; and/or wherein the coating layer is formed on at least one of the connected parts as in claim 18; and/or reaction mole ratio of components of the curing agent as in claim 19; and/or blending proportion of epoxy resin curing agent to epoxy resin as in claim 20; and/or thickness of the coating layer as in claim 21; and/or wherein the multifunctional compound reacted in forming the curing agent, is selected from the group consisting of the derivatives set forth in claim 1 (see claim 22).

The present invention is directed to a fuel system which includes at least one of various components such as, for example, a fuel vessel, molded parts for the fuel vessel and a tube for a fuel. In particular, the present invention is directed to such

fuel system having excellent performance in preventing permeation of, e.g., gasoline, while having good heat resistance and impact resistance, and bendability, without deterioration in preventing permeation of the gasoline.

In recent years, use has been made of thermoplastic resins in fuel systems, as compared with use of metal, providing advantages of a reduction in weight, prevention of rust, ease in molding and ability to be recycled. However, in previously proposed fuel systems, various performances, such as heat resistance, water resistance, impact resistance, and avoidance of permeation of gasoline, has not been sufficiently satisfactory.

Against this background, Applicants provide a fuel system excellent in gasoline barrier property, heat resistance and impact resistance, and which also (illustratively, when used in forming a tube of, e.g., rubber) has excellent flexibility. Moreover, the fuel system can be provided at relatively inexpensive cost, insuring a high profitability. Applicants have found that by forming the fuel system utilizing a thermoplastic resin and/or a rubber as the body of the fuel system, and providing a coating layer on at least one side of the body, the coating layer being formed by curing an epoxy resin composition including the epoxy resin and the epoxy resin curing agent recited in the present claims, the coating layer containing the amount of the skeletal structure of general formula (1) as in present claim 1; and wherein the coating layer has a gasoline permeability coefficient of  $2 \text{ g}\cdot\text{mm}/\text{m}^2\cdot\text{day}$  or less at  $60^\circ\text{C}$  in a relative humidity of 60%RH, objectives according to the present invention are achieved. In particular, an excellent gas barrier property is achieved, the fuel system has excellent heat and impact resistance, and bendability, the coating layer has excellent adhesiveness to the body of thermoplastic resin, and the fuel system can be provided relatively inexpensively.

Thus, as described on pages 17, 18, 23 and 24 of Applicants' specification, by utilizing the specified epoxy resin curing agent, and specified epoxy resin, in the epoxy resin composition which is cured to form the coating layer, the coating layer including the skeletal structure of general formula (1), and at least 30% by weight (of the total weight of the coating layer) being of the skeletal structure of general formula (1), as in the present claims, a good adhesiveness of the coating layer to various materials, high gasoline barrier property, flexibility and heat resistance are achieved.

Note that the multifunctional compound of (B) and the monovalent carboxylic acid of (C), in the present claims respectively include compounds having at least one acyl group which can form an amide group part by reacting with polyamine to form an oligomer, the multifunctional compound being selected from a specified group of acids and derivatives, and the monovalent carboxylic acids having 1-8 carbon atoms and/or a derivative thereof. As for these components (B) and (C), note the paragraph bridging pages 23 and 24, as well as the sole full paragraph on page 24, of Applicants' specification, describing illustrative specific materials as well as the derivatives.

Gerdes, et al. discloses a coated polymeric article, e.g., a polyethylene substrate, having reduced permeability for fuels, particularly gasoline-type fuels, and characterized by a two component, preferably three component, varnish coat comprising: (a) an epoxy resin, e.g., preferably having an epoxy equivalent weight of about 150-280, (b) an effective amount of a specified amine-based curing agent as set forth in lines 3-11 of column 2, and preferably a third varnish component which is a flexibilizer, e.g., a suitable amount of isocyanate prepolymers, e.g., one based on an isocyanate prepolymer containing ether groups and urethane groups. Note the paragraph bridging columns 1 and 2 of this patent. See also column 2, lines 37-41.

This patent discloses that suitable epoxy resins are those containing more than one epoxide group, e.g., 1.5-5, in the monomeric unit. See column 2, lines 56-58. Note also column 2, lines 59-68, for particularly suitable epoxy resins. Note also column 3, lines 1-35, for curing agents for use in forming the fuel impervious polymeric article of Gerdes, et al.

It is respectfully submitted that Gerdes, et al. requires an amine-based curing agent as set forth in column 2, lines 1-11; and it is respectfully submitted that this reference does not disclose, nor would have suggested, structure as in the present claims, wherein the epoxy resin composition cured to form the coating layer includes an epoxy resin curing agent as in the present claims, comprising a reaction product of (A) and (B) or reaction product of (A), (B) and (C), or wherein the coating layer has the recited gasoline permeability coefficient, or other features of the present invention, including the epoxy resin and skeletal structure of general formula (1) of the coating layer (much less the amount of skeletal structure of general formula (1) in the coating layer).

It is emphasized that Gerdes, et al. does not disclose, nor would have suggested, use of xylylenediamine. It is respectfully submitted that Gerdes, et al. would have neither taught nor would have suggested the skeletal structure of the formula (1), much less amount of 30% by weight or more, based on the weight of the coating layer, of the skeletal structure represented by the formula (1) in the coating layer, and advantages due thereto.

The contention by the Examiner that the disclosure of Gerdes, et al., with respect to the invention described therein, is not limited to the examples, is noted. However, as indicated previously, it is respectfully submitted that nowhere in Gerdes, et al., either in the general description or specific examples, is there a disclosure of

the use of xylylenediamine. Certainly, without disclosure of xylylenediamine, amount of the skeletal structure represented by the formula (1) in the coating layer would have neither been disclosed nor would have been suggested by Gerdes, et al.

It is respectfully submitted that Gerdes, et al. teaches that the glycidyl ether of bisphenol A is particularly suitable for the epoxy resin, as set forth in the last paragraph in column 2 of Gerdes, et al. It is respectfully submitted that Gerdes, et al. is completely silent about use of the glycidylamine part derived from metaxylylenediamine, as in the present claims.

Thus, it is respectfully submitted that Gerdes, et al. is deficient with respect to at least each of the following features set forth in the present claims, as well as the combination thereof, providing advantages as discussed herein:

- (1) the coating layer having the specified gasoline permeability coefficient;
- (2) wherein the epoxy resin includes at least one selected from an epoxy resin having a glycidylamine part derived from metaxylylenediamine, and an epoxy resin having a glycidylamine part derived from 1,3-bis(aminomethyl)-cyclohexane;
- (3) wherein the epoxy resin curing agent comprises a reaction product of (A) and (B), or a reaction product of (A), (B) and (C), as in claim 1; and/or
- (4) the coating layer contains the skeletal structure of formula (1); and/or
- (5) the coating layer contains such skeletal structure of formula (1) at least in an amount of 30% by weight based on the weight of the coating layer.

The Examiner refers to amount of the claimed formula (1), in connection with blending proportion of the epoxy resin to the epoxy resin curing agent, on page 4,

lines 3-6 of this Office Action mailed December 10, 2008. Apparently, reference to such blending proportion is to a description in Gerdes, et al. However, it is emphasized that Gerdes, et al. does not even disclose xylylenediamine. Apparently, the Examiner agrees with this argument, Examiner referring to xylylenediamine noting the paragraph bridging pages 2 and 3 of the Office Action mailed December 10, 2008. As Gerdes, et al. does not even disclose use of xylylenediamine, it is respectfully submitted that there is no basis for the conclusion by the Examiner that this reference would contain the claimed formula (1) in the amount of at least 30% by weight.

To the contrary, it is respectfully submitted that from the structure of the Example in Gerdes, et al., set forth in column 5 thereof, and even in light of teachings of other references, as applied in rejecting the present claims, the claimed formula (1) would be contained in an amount much less than 30% in Gerdes, et al.

Thus, the varnish formulation actually taught in the Example of Gerdes, et al. contains the following ingredients:

- (A) 59 parts by weight of epoxy resin;
- (B) 7 parts by weight of flexibilizer; and
- (C) 34 parts by weight of a mixture of:
  - 7.79 parts by weight of 3-aminomethyl-3,5,5 trimethylcyclohexylamine (diamine 1),
  - 6.38 parts by weight of a mixture of 2,2,4- and 2,4,4-trimethylhexamethylenedamine (diamine 2),
  - 5.67 parts by weight of epoxy resin,
  - 1.70 parts by weight of salicylic acid, and
  - 12.46 parts by weight of benzyl alcohol.

The molecular weight is 170 for diamine 1 ( $C_{10}H_{22}N_2$ ), 158 for diamine 2 ( $C_9H_{22}N_2$ ), and 136 for xylylenediamine ( $C_8H_{12}N_2$ ).

If xylylenediamine is used in place of the diamines 1 and 2 in the same molar amounts, the varnish formulation contains the following ingredients:

- (A) 59 parts by weight of epoxy resin;
- (B) 7 parts by weight of flexibilizer; and
- (C) 34 parts by weight of a mixture of:
  - 6.23 parts by weight  $((7.79/170) \times 136)$  of xylylenediamine in place of the diamine 1,
  - 5.49 parts by weight  $((6.38/158) \times 136)$  of xylylenediamine in place of the diamine 2,
  - 5.67 parts by weight of epoxy resin,
  - 1.70 parts by weight of salicylic acid, and
  - 12.46 parts by weight of benzyl alcohol.

Letting the varnish formulation consist of only the epoxy resin and the amine curing agent for simplification, the content of the claimed formula (1) in a composition corresponding to that in Gerdes, et al., but including xylylenediamine, is calculated as 17% by weight  $(12/(12 + 59) \times 100)$ , which is far lower than the claimed range of 30% by weight or more. It should be noted that the content in the actual formulation in the Example in Gerdes, et al. would be smaller than 17% by weight, because of the presence of other ingredients.

Thus, the content of the claimed structure (1) corresponding to the Example of Gerdes et al., even where xylylenediamine is used, is much smaller than the presently claimed range. It is respectfully submitted that Gerdes, et al. would have



neither taught nor would have suggested, and in fact would have taught away from, amount of skeletal structure of general formula (1) as in the present claims.

It is respectfully submitted that the additional teachings of the secondary references as applied by the Examiner would not have rectified the deficiencies of Gerdes, et al., such that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art.

Tashiro, et al. discloses epoxy resin compositions having room temperature curability, the curing agent being sufficiently curable even in a wet state and having an improved compatibility with tar. The curing agent disclosed in this patent can be obtained by addition and condensation reactions of three components A, B and C, A being an acrylic or methacrylic acid ester, B being one of slightly water-soluble or insoluble aliphatic amines having a primary amine radical or an amine mixture thereof, and C being (a) a xylylenediamine having a specified structural formula and having both properties of aliphatic amine and aromatic amine, and (b) a 70:30 mixture of metaxylylenediamine and paraxylylenediamine. See column 1, line 59 through column 2, line 16. Note also column 2, lines 17-49, describing how the components A-C of the curing agent are reacted.

Huang, et al. discloses a heat-curable resinous composition comprising polyglycidyl xylylenediamine, obtained by the reaction between xylylenediamine and epichlorohydrin. This patent document discloses that the disclosed material has a relatively low viscosity resulting in a good workability, and gives cured products exhibiting a high heat distortion temperature. Note column 1, lines 6-9 and 61-67. Note also column 4, lines 21-25. Huang, et al. discloses that the polyglycidyl xylylenediamine can be readily cured with the aid of curing agents customarily used for curing of glycidyl compounds, such as aliphatic or aromatic polyamines and

organic carboxylic anhydrides. Note column 4, lines 37-41. This patent further discloses that the polyglycidyl xylylenediamine provides an industrial material exhibiting a low viscosity suitable for adhesives and castings, and a cured product prepared therefrom shows a high heat resistance. See column 5, lines 19-25.

Initially, it is respectfully submitted that the teachings of Gerdes, et al., as applied by the Examiner, would not have been properly combinable with the teachings of either of Tashiro, et al., or of Huang, et al. Thus, it is noted that Gerdes, et al. is directed to a fuel impervious polymeric article, facing the problem of providing such article without a primer or adhesion promoter. In contrast, Tashiro, et al. is directed to an epoxy resin curing agent which is sufficiently curable even in a wet state and having an improved compatibility with tar; and Huang, et al. is directed to heat-curable resin compositions comprising polyglycidyl xylylenediamine, with a relatively low viscosity and high heat distortion temperature, suitable for adhesives and coatings, without disclosure in either of Tashiro, et al. or Huang, et al. of whether or not the composition is permeable to fuel. It is emphasized that Tashiro, et al., and Huang, et al. are silent as to the structures formed having fuel barrier properties. In view of differences in technology in the teachings of the applied references, and further in view of differences in problems addressed by each of these references, it is respectfully submitted that one of ordinary skill in the art concerned with in Gerdes, et al. would not have looked to the teachings of Tashiro, et al. or of Huang, et al. In other words, it is respectfully submitted that the teachings of these references are directed to non-analogous arts.

In any event, particularly in view of the differences in technology in the teachings of the applied references, and also in view of differences in problems addressed by each, it is respectfully submitted that there would have been no proper

reason to combine the teachings of these applied references, as applied by the Examiner. Absent such reason, it is respectfully submitted that the combination of teachings of these references as applied by the Examiner uses impermissible hindsight, i.e., such combination is improper under the guidelines of 35 USC 103.

It is emphasized that as the epoxy resins curable by the curing agent disclosed therein, Tashiro, et al. discloses only glycidyl ethers of polyhydric phenols or polyhydric alcohols. Note the paragraph bridging columns 2 and 3 of this patent. It is respectfully submitted that Tashiro, et al. is completely silent with respect to glycidylamine of xylylenediamine.

In addition, it is respectfully submitted that the epoxy resin composition of Tashiro, et al. is to provide a material having improved compatibility with tar (that is, an epoxy paint for tar). It is respectfully submitted that Tashiro, et al. provides no disclosure with respect to gasoline barrier properties of a cured product of the epoxy resin composition described therein. It is respectfully submitted that the teachings of Tashiro, et al., even in combination with the teachings of the other references applied by the Examiner, including Gerdes, et al., would have neither taught nor would have suggested the features of the present invention as discussed previously, including at least features of claim 1 discussed previously.

Similarly, note that the epoxy resin of Huang, et al. is disclosed as an adhesive and casting, Huang, et al. teaching that polyglycidyl xylylenediamines obtained by the reaction between xylylenediamine and epichlorohydrin have a relatively low viscosity resulting in good workability and giving a cured product exhibiting a high heat distortion temperature. To be emphasized is that this reference, also, provides no disclosure with respect to gasoline barrier properties. Thus, the teachings of Huang, et al., even together with the teachings of Gerdes, et

al. and Tashiro, et al. would have neither taught nor would have suggested the gas barrier properties achieved by the structures of the present invention, including the gas barrier property of the coating layer.

It is respectfully submitted that the Examiner has picked and chosen bits and pieces of each of Tashiro, et al. and of Huang, et al., together with bits and pieces of the teachings of the fuel impervious polymeric article of Gerdes, et al., in coming to a conclusion of obviousness of the presently claimed subject matter. It is respectfully submitted that the only reason for choosing bits and pieces of Gerdes, et al. and of the secondary references, as applied by the Examiner, is hindsight use of Applicants' disclosure. Such hindsight use of Applicants' disclosure is clearly inappropriate under the requirements of 35 USC 103.

Moreover, even assuming, arguendo, that the combined teachings of Gerdes, et al., Tashiro, et al. and Huang, et al. would have disclosed the specific materials of the coating layer as in the present claims, the Examiner has provided no proper basis for concluding that the coating layer taught by the references contains skeletal structure represented by the formula (1) in an amount of 30% by weight or more based on the weight of the coating layer. Again, attention is directed to the calculations set forth earlier herein, showing that in the Example in Gerdes, et al. the content of the formula (1) would be smaller than 17% by weight, were xylylenediamine used in place of the diamines 1 and 2 in the same molar amounts in Gerdes, et al. It is respectfully submitted that this would be the sole basis for determining an amount of formula (1) skeletal structure, from the teachings of Gerdes, et al. and/or the combined teachings thereof with teachings of Tashiro, et al., and of Huang, et al., as applied by the Examiner. Clearly, the disclosures of the applied references would have taught away from the amount of the skeletal structure

represented by the formula (1) in the coating layer as in the present claims, and advantages thereof.

In connection with claim 23, Watanabe, et al. discloses a resin composition and a molded article formed therefrom, which is excellent in heat resistance, rigidity, surface smoothness and adhesion to a coating composition, the resin composition comprising an MX nylon which is formed from xylylenediamine and specified aliphatic dibasic acid, a modified polyphenylene ether resin, a fibrous inorganic filler having an average fiber diameter of 10  $\mu\text{m}$  or less, a powdery inorganic filler having an average particle diameter of 10  $\mu\text{m}$  or less, an epoxy resin, and a copper compound and/or a powdery phenolic resin. Note column 2, line 57, through column 3, line 20. This patent discloses a lamp reflector obtained by molding this resin composition and coating the composition with a metal. See column 3, lines 21-24.

It is emphasized that Watanabe, et al. discloses a resin composition, without any disclosure therein of a fuel system, and, in particular, without any disclosure therein of a coating layer which is a barrier layer for gasoline. In particular, it is respectfully submitted that Watanabe, et al. provides no disclosure at all with respect to the resin composition described therein being used in an article having a barrier layer for gasoline. It is respectfully submitted that one of ordinary skill in the art concerned with in Gerdes, et al., would not have looked to the teachings of Watanabe, et al., in view of differences in technology and differences in problems addressed by the two references.

Even assuming, arguendo, that the teachings of Gerdes, et al., Huang, et al., Tashiro, et al. and Watanabe, et al. were properly combinable, it is respectfully submitted that such combined teachings would have neither disclosed nor would

have suggested such a fuel system as in the present claims, having the recited coating layer with the gasoline permeability coefficient thereof, formed by curing an epoxy resin composition including the epoxy resin and the epoxy resin curing agent as in the present claims, and, moreover, where the coating layer contains skeletal structure represented by the formula (1) in the present claims in an amount thereof as in the present claims, and advantages due thereto.

In the paragraph bridging pages 3 and 4 of the Office Action mailed December 10, 2008, the Examiner sets forth allegations as to motivation for combining the teachings of the applied references. Emphasizing that Gerdes, et al. is directed to a fuel impervious polymeric article, as a main purpose thereof, while neither of Tashiro, et al. or Huang, et al. discloses gasoline permeability of the materials set forth therein, it is respectfully submitted that the motivation alleged by the Examiner is improper, under the requirements of 35 USC 103.

Moreover, it is emphasized that the Examiner has utilized a curing agent in Tashiro, et al., ignoring the epoxy resin described therein; and has used a polyglycidyl xylylenediamine in Huang, et al., ignoring other components of the composition described therein. Such use of bits and pieces of the various references applied by the Examiner, ignoring the teachings of the references as a whole, is improper, under the requirements of 35 USC 103, as discussed previously.

The contention by the Examiner in the last sentence bridging pages 3 and 4 of the Office Action mailed December 10, 2008, that the recitation of the acrylic acid derivative being a derivative that can form an amide by reacting with polyamine "is given little patentable weight as it is directed to a process limitation rather than a structural limitation", is respectfully traversed. It is respectfully submitted that such

recitation in connection with the acrylic acid derivative is a recitation of a property of the multifunctional compound, and must be considered in determining patentability.

In view of the foregoing comments, and further in view of all of the evidence of record, including the Declaration submitted September 2, 2008, reconsideration and allowance of all claims presently pending in the above-identified application are respectfully requested.

Applicants request any shortage in fees due in connection with the filing of this paper be charged to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (case 396.42795X00), and credit any excess payment of fees to such Deposit Account.

Respectfully submitted,

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